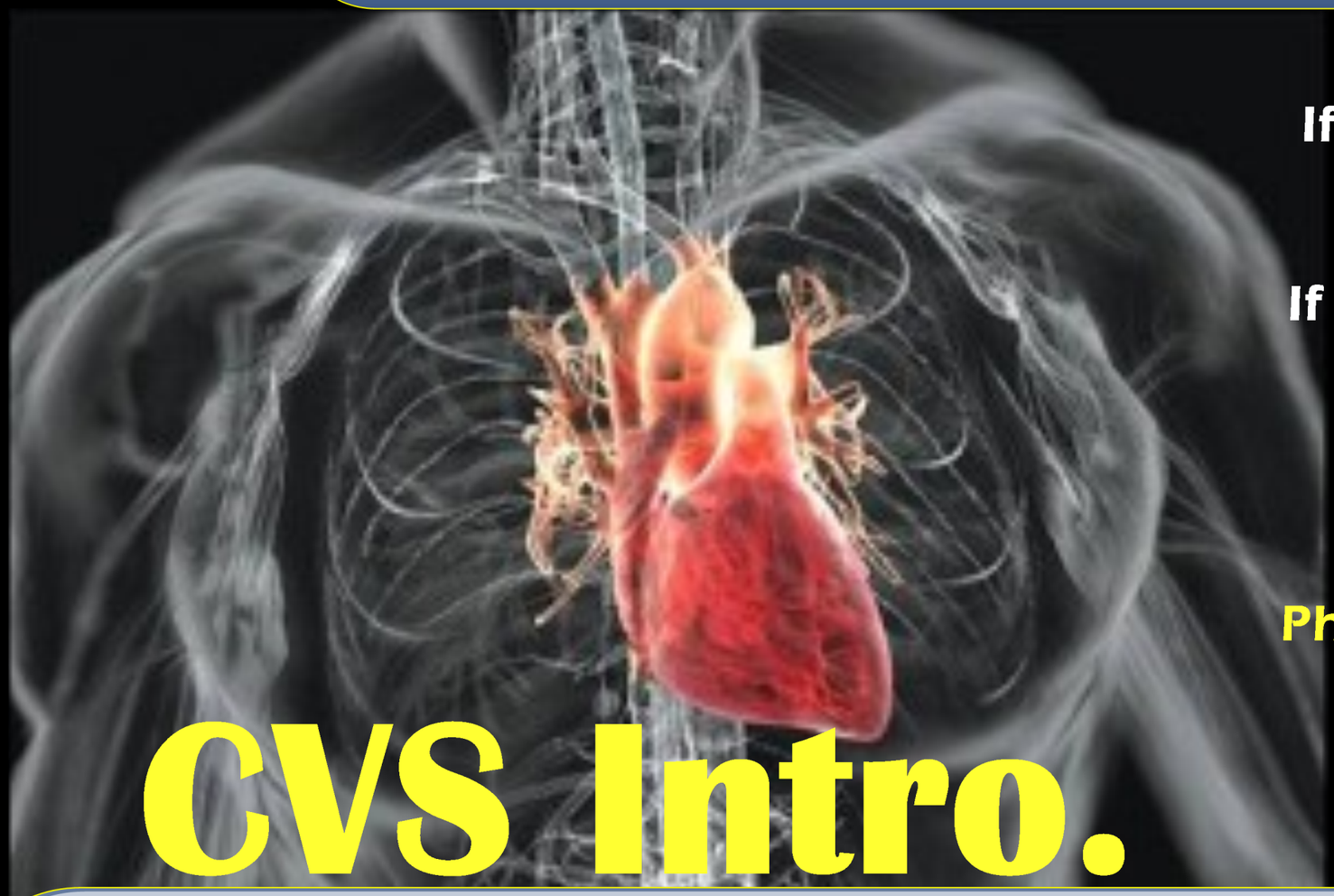
Draw Pharmacology in your mind



CVS Intro.

If you are a pharmacy student
If you are postgraduate and want to revise pharmacology by an easy way
If you are using any pharmacology reference
this file will aid you
> And wait for more <

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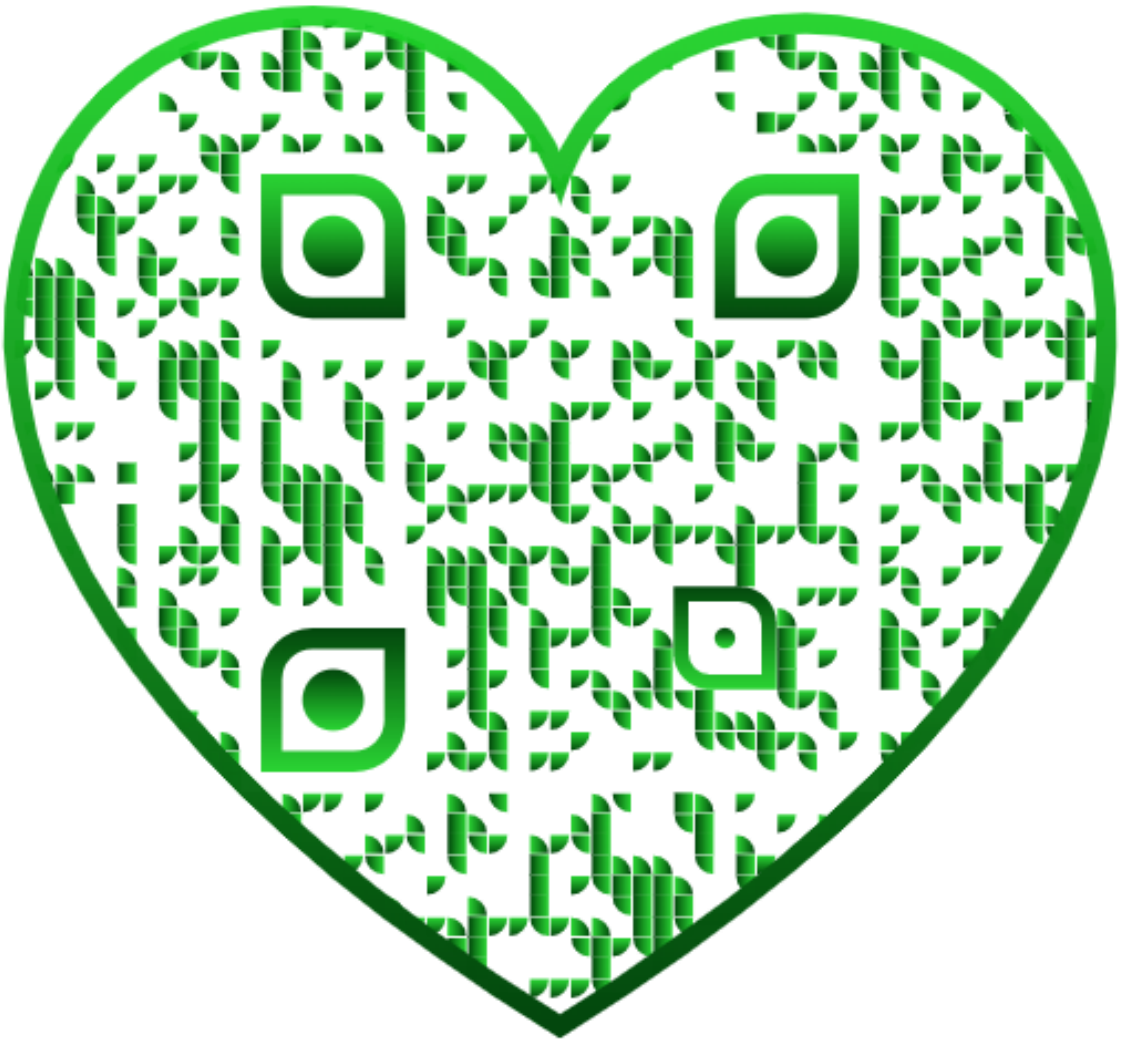
لا تنسونى من صالح دعائكم

Pharmacist. **Alaa Nasr**

د. آلاء نصر



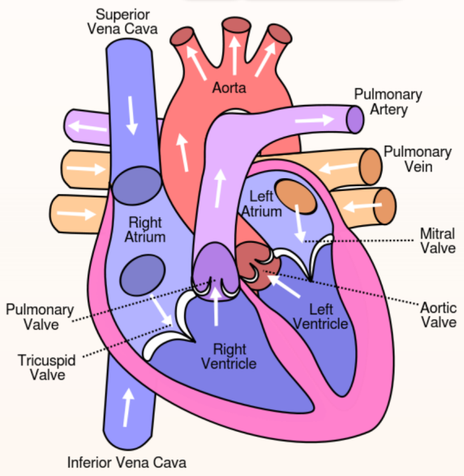
CARDIOVASCULAR SYSTEM

Introduction

Cardiovascular system

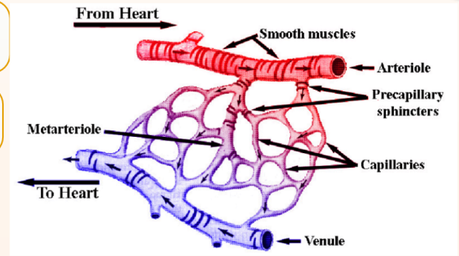
Heart (myocardium)

- The heart is the **muscular pump** of the body (muscle in nature)
- It beats non-stop for the entire life time to **supply blood which is loaded by oxygen and nutrients** to all tissues of the body



Blood vessels

- **Arteries (bigger) → arterioles (smaller)** — Carrying blood from **heart** to **tissues**
- **Veins (bigger) → Venules (smaller)** — Carrying blood from **tissues** to **heart**
- **Capillaries** — Connecting artrioles to venules



Anatomical background about the heart

- It is composed of **4 chambers** → *(2 atria and 2 ventricles)*
- **Venous blood** → enters the **right atrium** through **vena cava** *(inferior & superior)*
- The blood passes from the **right atrium to the right ventricle** which contracts to push the blood through the **pulmonary artery** to the **lungs** where → *exchange of O_2 and CO_2 occurs*
- Blood **returns to the heart** from the **lungs** through **4 pulmonary veins** that enter the **left atrium**
- Blood passes from the **left atrium to the left ventricle** which contracts to push the blood through **aorta** which then → *distribute blood to all body tissues*
- ***Notes:***

*1. The wall of the **left** ventricle is thicker than the **right** ventricle*
2. The wall of atria is thinner than ventricles
(so left ventricle > right ventricle > atria in thickness)
3. Around the heart there are **coronary arteries** which → *supply the heart with blood*

Beating of the heart

- The heart can beat spontaneously at a rate **40 beats/min**
- so, beating of the heart is **myogenic in nature** (not neurogenic) that means → it does not need an intact nerve supply to beat

Evidence

1. The heart of the fetus during pregnancy beats before the heart is innervated
2. Isolated frog's heart can beat spontaneously

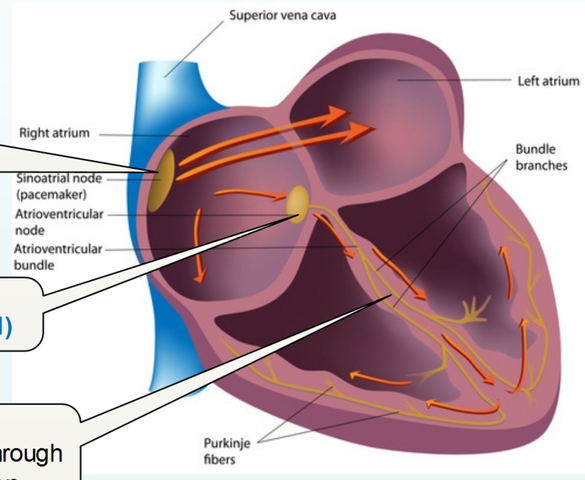
Conducting system of the heart

The heart beats rhythmically

1. Impulse starts from sinoatrial node (SAN) that travels through **atria → contraction**

2. Then it reaches **atrioventricular node (AVN)**

3. Then to **atrioventricular bundle (AVB)** then travels through the **ventricles → contraction**



SAN is called the pacemaker of the heart as it is → the **most rapidly beating part of the heart so,** SAN controls the heart rhythm and initiates the contraction of the heart

In general .. the part discharging at the highest rate is the pacemaker of the heart

How does the heart contract ?
Electrical change (depolarization) happens followed by **mechanical change** (contraction)

Nerve supply to the heart

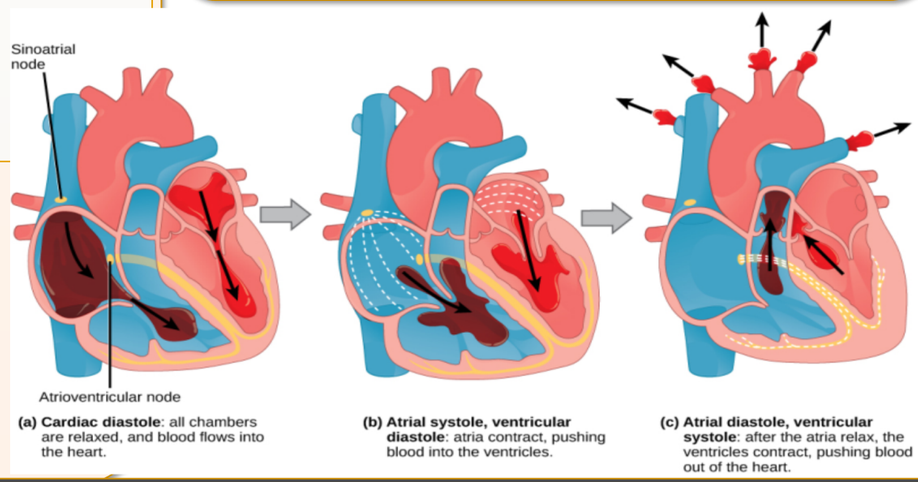
- Although the rhythmic beating of the heart is myogenic, it still under the influence of autonomic nervous system by its 2 branches
- SAN receives impulses from sympathetic and vagus (parasympathetic) nerves

Sympathetic nerve
- Release **NA**
- ⇑ Heart rate

Vagus parasympathetic nerve
- Release **Ach**
- ⇓ Heart rate

Sympathetic and vagus nerves are under the control of **higher centers in the brain**

Neural control of the heart speed the pulse up to **70 beats/min**


Sinoatrial node
Atrioventricular node
(a) Cardiac diastole: all chambers are relaxed, and blood flows into the heart.
(b) Atrial systole, ventricular diastole: atria contract, pushing blood into the ventricles.
(c) Atrial diastole, ventricular systole: after the atria relax, the ventricles contract, pushing blood out of the heart.

Some important definitions

1. Cardiac output (CO)

- Volume of blood *(in liters)* pumped by the heart in one minute
- **CO depends on 2 variables:**

1. Heart rate
2. Stroke volume

Cardiac output = Heart rate X Stroke volume = 5 L

Cardiac output is connected to **blood pressure**

2. Heart rate

- Number of beats in one minute
- Normally 70 beat/min
- If the drug ⇑ **Heart rate** → so it has **positive chronotropic** effect → causes **tachycardia**
- If the drug ⇓ **Heart rate** → so it has **negative chronotropic** effect → causes **bradycardia**

3. Stroke volume

Volume of blood *(in ml)* ejected by the heart in **each beat** (in normal adult about 70 ml/beat)
It indicates **force of contraction** of the heart
⇑ SV → ⇑ force of contraction → **positive inotropic effect**